

# Single-pilot Citation primed for competition

**David M. North/Wichita**

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*From preflight to touchdown, Cessna's latest Citation offers simplicity and efficient flying for the single pilot—and its low price makes it a serious competitor in the corporate turboprop market*

Cessna Aircraft has combined a unique blend of new technology and proven aircraft systems to achieve high performance and ease of handling with single-pilot operations in its new CitationJet.

Over the years, this *Aviation Week & Space Technology* pilot has flown most of the earlier Citation series of business jets and many other corporate aircraft, and would regard the CitationJet as one of the most enjoyable to fly. Much of this enjoyment is afforded by the simplicity of operation built into the 10,500-lb. Cessna aircraft.

This business jet also will appeal to entrepreneur/pilots and top officials at small companies who occasionally like to take the left seat. Cessna had approximately 100 firm orders for the CitationJet prior to first delivery to an operator on Mar. 30, even in these difficult marketing times for corporate aircraft.



*Cessna CitationJet is powered by two Williams-Rolls FJ44 turboprop engines. The aircraft is certified for single pilot operations.*

Cessna designed the CitationJet to compete with the high end of the corporate turboprop market. Cessna's long heritage of building business jets and a planned long production run for the CitationJet is reflected in the new business jet's \$2.62-million price—a price far below the \$4-million-plus price tag for the Beech Starship and Piaggio Avanti turboprops and below the \$3.5-million range for the Beech B200. The CitationJet, with accommodations for a seven-place maximum, has a smaller cabin area than the two Beech turboprops. The Avanti cabin is shorter in length but larger in volume, with accommodations for two to three more people than the CitationJet.

The CitationJet, powered by two 1,900-lb.-thrust Williams-Rolls FJ44 engines, is the smallest Citation, closest in size and weight to the original Citation 500 certified in February, 1972, at a maximum take-off gross weight of 10,850 lb. and later raised to 11,650 lb. The maximum takeoff weight of the CitationJet is 10,400 lb.

I had the opportunity to fly the No. 6 CitationJet (N106CJ) last month with Joe Lear, a Citation demonstration pilot, from Cessna's headquarters and delivery center based here. Lear pointed out the features of the CitationJet in the delivery center hangar and during the



*The aircraft is equipped with Honeywell SPZ-5000 flight director/autopilot and two 5-in. displays. A sticksbaker is installed. Instruments are easy to read even in bright sunlight, and cockpit noise levels are low.*

preflight. The nose baggage compartment is accessible from both sides of the fuselage and can accommodate a weight of 425 lb. The rear external baggage compartment holds 300 lb. of luggage. Unlike some earlier Citations, the Safeflight angle-of-attack vane can be removed from outside, and the aircraft has a stickshaker, but not a stick-pusher, installed.

The CitationJet's straight wing is very smooth, without a trace of vortex generators, wing fences or any other aerodynamic devices. Cessna spent four years at the National Aeronautics and Space Administration's Langley wind tunnel facility to achieve natural laminar flow characteristics over 31% of the chord of the wing. The wing also exhibits a high quality of bonding manufacturing technique and contains almost all of the aircraft's 3,220 lb. of usable fuel.

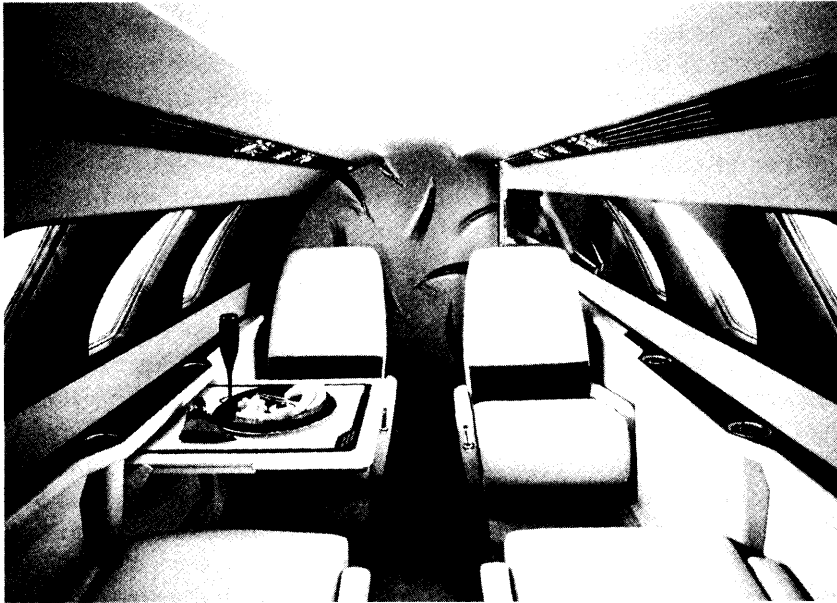
The landing gear doors are attached to the landing gear assembly and do not require a separate operation to open or close. The hydraulic system uses a Bracko synthetic fluid, with a sight gauge and filler accessible behind the right wing. Cessna has made every effort to make all the aircraft systems easy to check during preflight and maintenance without tearing the aircraft apart.

One modification being made to the engine and nacelle installation is the location of the oil dipstick on the engines. Now it takes a two-step ladder to reach the dipstick, but beginning with CitationJet No. 32, the dipstick and sight gauge will be able to be seen and be reachable from the ground. One advantage to the high mounting of the engines is that there is little chance of foreign object damage or ice ingestion from the wings, Lear said.

I sat in the cabin with Lear prior to taking the left pilot seat in the CitationJet. The primary layout for the 4.8-ft. high cabin includes a four-seat club arrangement. To the rear of the club arrangement is an area for inside luggage and a lavatory seat. Cessna is moving the seat adjacent to the emergency exit to the opposite side, and there is a possibility that the seat could be certified for occupancy during take-off and landing. A side-facing jump seat located across from the main entry door is certified for use, making a standard five-place cabin.

Sitting in the right rear club seat, I found that my shoulder was hitting the cabin wall. But by moving the seat inward, my 72-in. frame was able to sit comfortably upright. Executive fold-out tables are an option. A refreshment center is located forward and left of the entry door. Lear said that the cabin windows were all triple pane, and the measured noise levels in flight for the rear cabin seats were in the 78-80 dB. range.

The gross weight of the CitationJet was 9,000 lb., well below the 10,500-lb. maximum weight for the aircraft. The empty weight of the



*Standard cabin design is for a four-place club arrangement and a side-facing seat behind the cockpit. A lavatory seat is located behind the club seat grouping.*

No. 6 aircraft was 6,394 lb. The fuel on board the aircraft was 2,100 lb., some 1,120 lb. below the maximum 3,220 usable fuel.

The right engine was started electrically, and a cross-bleed start was used for the left engine. Similar to other Citations, there are no controls, circuit breakers or gauges on the overhead panel, and the engine start switches are located on the left side of the front instrument panel with the other system switches.

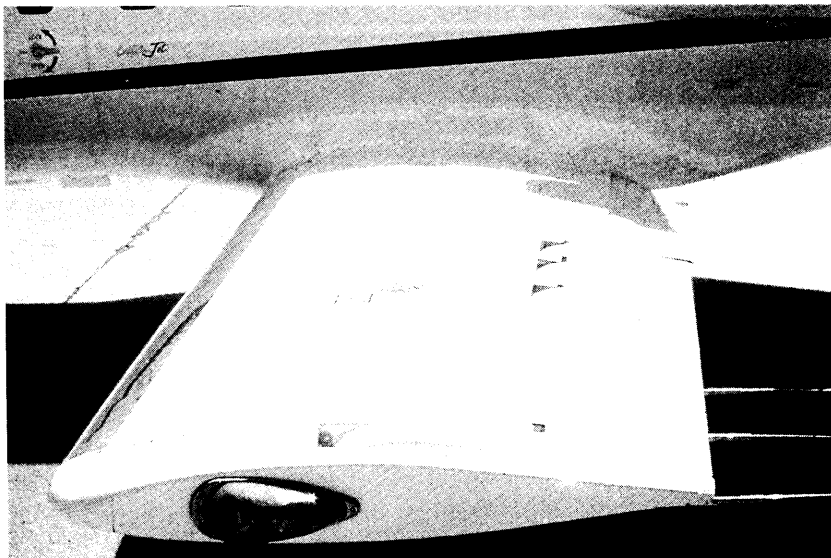
The CitationJet's instrument panel is strictly designed for single-pilot operations. The flight instruments on the copilot side consist of a basic-T, with an attitude gyro that looks like a backup or emergency instrument. A single-pilot 525S type rating is possible with less than a week's transition training.

Fuel flow at idle power during taxi was 100 lb./hr. per engine, and the  $N_1$  was 28%. Cessna uses thrust attenuators on the FJ44 engines to reduce brake use at idle thrust. The attenuators are hydraulically activated and deploy on the ground when the power levers are in the last 25% of the quadrant. The CitationJet taxied at a comfortable pace at idle power without the use of brakes, except to turn. The brakes were effective and did not have a tendency to grab.

Rudder pedals provide nosewheel steering for the business jet and I found that there was ample authority during most turns, but execution of sharper turns required the use of brakes. I would have liked a tighter turning radius available through the use of the rudder pedals only.

The  $V_1$  takeoff decision speed was calculated to be 97 kt. for the 9,000-lb. (4,082 kg.) aircraft using standard takeoff 15-deg. flap setting. The midafternoon temperature in Wichita was 41F. The  $V_r$  rotation speed was 101 kt., and the  $V_2$  takeoff safety speed was 102 kt. At the 10,400-lb. (4,717-kg.) maximum takeoff gross weight, the same speeds would have been 107 kt., 107 kt. and 110 kt., respectively, on a standard day.

I advanced the power levers to attain the target  $N_1$  setting while releasing the brakes. Acceleration was rapid with a 10-kt. headwind component. The balanced field length had been calculated to be 2,190 ft. (667 meters), and the actual takeoff roll was estimated to be near 1,600 ft. Although the CitationJet is certified to Federal Aviation Regulations Part 23, the takeoff performance meets the constraints of FAR Part 25.



*Cessna has achieved natural laminar flow characteristics over 31% of the chord of the wing. The laminar flow allows for a 10-15 kt. increase in cruise speeds.*

The nose was raised to a 10-deg. attitude at rotation, and the CitationJet fairly leapt into the air. Forgetting single-pilot operations, I asked Lear to raise the landing gear and flaps, when it actually was more convenient for me to clean up the aircraft.

An altitude of 10,000 ft. was reached in slightly under 3 min. at 220 kt. The book cruise climb is 240 kt., and maximum rate climb for the aircraft's gross weight is 184 kt. Fuel flow passing through 10,000 ft. was 690 lb./hr. per engine, and the rate of climb was in excess of 3,200 fpm. The fuel flow had dropped to 640 lb./hr./eng. at 15,000 ft., and the rate of climb was 2,600 fpm. Total time to 15,000 ft. was 5 min., with airspeed at 225 kt. Fuel used from takeoff was near 120 lb.

Another 2 min. was required to reach 20,000 ft., and the rate of climb passing through 20,000 ft. was 1,900 fpm. Fuel flow was now 560 lb./hr./eng.

A total of 10 min. was required to reach 25,000 ft. at 207 kt. The fuel flow was now 500 lb./hr./eng., and the rate of climb was 1,700 fpm. The rate of climb was at 1,500 fpm passing through 30,000 ft., and fuel flow was 430 lb./hr./eng. The speed was 207 kt., and it had taken 13 min. to reach that altitude.

The initial cruising altitude of 35,000 ft. was reached in 17 min., and the rate of climb just prior to reaching altitude was 900 fpm. The total fuel used from the blocks was 400 lb. These figures were close to those contained in the CitationJet flight planning guide. Lear said the numbers in the guide were developed from the flight test program and were fairly accurate.

This assessment was confirmed when we took the high-speed cruise figures at 35,000 ft., 21 min. after takeoff. As in other straight-wing Citations, the power is advanced to the maximum  $N_1$  allowable at the altitude, and you take the resulting speed. The  $N_1$  was 101.2%, and the indicated speed, 225 kt. The true airspeed was 380 kt. and the total fuel flow was 820 lb./hr. on the near-standard day.

When I asked Lear about long-range cruise figures, he said that instead of pulling the power back to a long-range setting, the demonstration pilots normally just climbed to a higher altitude if possible. The planning guide shows a true airspeed of 284 kt. and a total fuel flow of close to 510 lb./hr. at our 8,500-lb. (3,859-kg.) gross weight at long-range cruise at 35,000 ft.

Once cleared by air traffic control the Honeywell SPZ-5000 autopilot/flight director was used to climb from 35,000 ft. to 41,000 ft. The vertical pitch was set at a 1,000-fpm rate, and the aircraft smoothly leveled at the CitationJet's maximum certificated altitude.

The CitationJet is equipped with two Honeywell 5-in. EFIS displays on the pilot's instrument panel. The displays were easy to read,

even in the bright sunlight. Cessna's attempts to keep the aircraft simple to operate by a single pilot were evident. Although Lear helped me with the operation of the autopilot and communications, I found that I easily adapted to working these functions alone.

If the CitationJet had been flown directly to 41,000 ft., the planning guide lists a time-to-climb of 32 min. and 450 lb. of fuel used from takeoff. At 41,000 ft., with maximum power, the indicated airspeed (IAS) was 182 kt. and the true airspeed (TAS) was 362 kt. with a fuel flow of 620 lb./hr. The Mach number was 0.63.

The majority of holders of CitationJet orders have opted for the optional Bendix/King KLN-90 panel-mounted GPS long-range navigation system, replacing the standard Bendix/King KLN-88 Loran C system. A King/Bendix RDS 81 color weather radar is standard equipment.

I performed a 180-deg. turn back to the Wichita area at 41,000 ft. A 15-deg. bank angle was selected rather than the 29-deg. available through the autopilot. During the turn, the speed increased to Mach 0.64 with a 366 kt. TAS and the same 620 lb./hr. fuel flow. Cessna estimates that the natural laminar flow characteristics of the wing gives the CitationJet an additional 1,015-kt. cruise speed.

The sound level in the cockpit was low at 41,000 ft., with communications held at conversational levels. The cabin altitude was 7,200 ft. with 8.5 psi. differential pressure. The pressurization system does not require any inputs after setting the destination altitude. Cabin cooling is provided by a Freon system.

The CitationJet range and payload preliminary figures show a range of 1,100 naut. mi. with six passengers (if lavatory seat is certified) and a crew of two. The range estimates are based on cruise at maximum thrust, zero wind and 45-min. reserves. With five passengers, the range increases to 1,220 naut. mi.; with four, 1,350 naut. mi., and four passengers and instrument flight rule reserves, 1,250 naut. mi.

During the descent, the speedbrakes were deployed at the aircraft's maximum Mach number, 0.70, with only a slight drop in the nose. The speedbrake on the top and below the wing deploys 60-deg., and speed reduction was noticeable at the same attitude.

I leveled the aircraft at 15,000 ft. to perform stalls. Lear said that there were no problems with the center of gravity loading of the CitationJet. He said you could only exceed the aft limit by loading up the aft baggage compartment to its maximum capacity with a single pilot.

With the CitationJet in clean configuration and power levers at idle and the aircraft slowed at a 1 kt./sec. rate, the stickshaker activated at 95 kt. The aircraft reached stall at 89 kt., and the only indication was a drop in the pitch attitude from 10 deg. to 5 deg. with a

slight increase in rate of descent. Aileron control was available throughout the maneuver, and with quick response a pilot could easily limit altitude loss to less than 100 ft.

With the landing gear extended and flaps in the 35-deg. landing position, the shaker activated at 90 kt. The CitationJet stalled at 80 kt. with the same control into the stall as in clean configuration. It would be difficult for a pilot to get into trouble in the CitationJet, unless the pilot persisted in the attempt.

I had performed some steep turns while at 35,000 ft. and at the lower altitudes, and found that aileron and pitch control forces were lighter in the CitationJet than I remember on other Citations. The aircraft is extremely nimble and will go exactly where you want it to go.

The aircraft was flown to an instrument landing approach at the Wichita airport. The display on the Honeywell attitude indicator was easily followed, and I had the choice of using either the V-bar or the crossed-line display for the approach. The trailing-link landing gear makes it easy for a CitationJet first-timer to make a good landing.

All three landings were smooth, and the only difficulty I had was slowing the aircraft down because of its clean aerodynamics. The power had to be pulled to idle at initiation of flare. During the initial approach and in the tight visual landing pattern, the engines were responsive and did everything asked of them. Total fuel used during the 1.5-hr. flight was 1,200 lb. The time from blocks to blocks was 1.6 hr., with three landings.

The visibility from the cockpit, as it is in most Citations, was excellent, and other aircraft in the pattern were easily monitored. The pitch and aileron forces at the slower speeds were equally responsive. The CitationJet is equipped with a full-time anti-skid brake system. The landing distance is also shortened by the deployment of the speed brakes at landing. The CitationJet can be used on short fields. The aircraft's anti-ice system did not have to be used during the flight. Bleed-air from the engine is used on the front of the wing. Inflated boots are used to deice the horizontal stabilizer.

The Williams-Rolls FJ44 engine is remarkably small, weighing 445 lb. and includes a single-piece titanium fan. The approved time-between-overhaul is 3,500 hr., and Lear said that they have not experienced any difficulty with the FJ44 during flight testing.

Cessna has approximately 100 orders for the CitationJet, and of those, approximately 30% come from owners of other Citations. Another 30% are from owners of turboprop aircraft, while the remainder are nonaircraft owners or operators of multiengine piston aircraft. Cessna plans to deliver 47 CitationJets this year and 80 in 1994 and is offering financing through Cessna Finance.



With the combination of low entry price and the simplicity, efficiency and performance Cessna has embodied in the CitationJet, the percentage of turboprop owners opting for the business jet is likely to increase. Cessna also claims low operating costs for the CitationJet and a strong support organization.

## CITATIONJET SPECIFICATIONS

### POWERPLANT

Two Williams-Rolls FJ44 turboprop engines with 1,900 lb. of thrust each.

### WEIGHTS

Maximum ramp weight	10,500 lb. (4,762 kg.)
Maximum takeoff weight	10,400 lb. (4,717 kg.)
Maximum landing weight	9,700 lb. (4,399 kg.)
Maximum zero fuel weight	7,900 lb. (3,583 kg.)
Maximum usable fuel	3,220 lb. (1,460 kg.)
Standard empty weight	6,159 lb. (2,793 kg.)
Payload with full fuel	721 lb. (327 kg.)

### DIMENSIONS

Overall length	42.6 ft. (13.0 meters)
Overall height	13.7 ft. (4.2 meters)
Wingspan	46.8 ft. (14.3 meters)
Aspect ratio	8.5
Cabin length (between pressure bulkheads)	15.9 ft. (4.85 meters)
Cabin height	4.8 ft. (1.45 meters)
Cabin width	4.9 ft. (1.49 meters)

### PERFORMANCE

Takeoff distance at MTW, ISA and FAR 25	3,080 ft. (938.8 meters)
Landing distance at 9,700 lb. and ISA	2,750 ft. (838.2 meters)
Maximum cruise speed, 8,500 lb. at ISA	380 kt. TAS (704 km./hr.)
Airspeed limit to 30,500 ft.	260 kt. CAS (481 km./hr.)
Airspeed limit above 30,500 ft.	Mach 0.70
Rate of climb, one engine	1,070 fpm (326 mpm.)
Rate of climb, two engines	3,450 fpm (1,052 mpm.)
Ceiling, maximum certified	41,000 ft. (12,497 meters)
Ceiling, single engine	26,200 ft. (8,138 meters)
Range with full fuel, 45 min. reserves	1,500 naut. mi. (2,779 km.)